PROWESS
SYSTEMS

FS² Film Scanning System

PROWESS

FS²
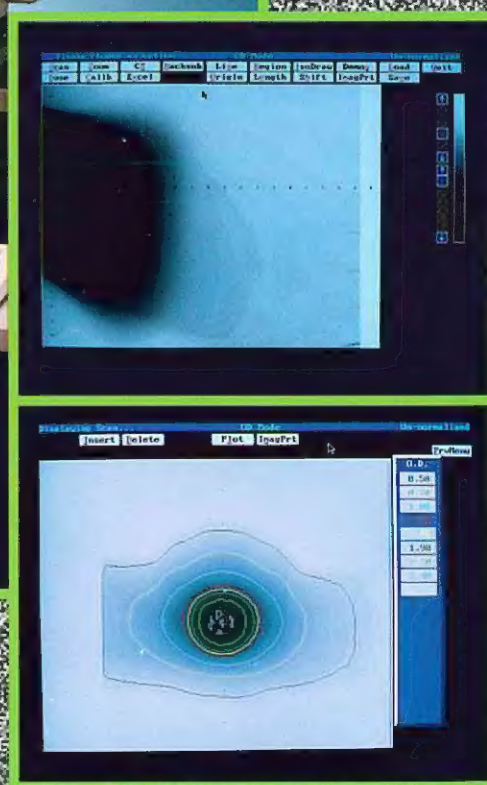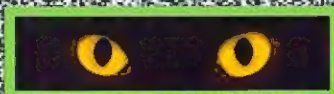
FILM SCANNING SYSTEM

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PROWESS *FS²*
FILM SCANNING SYSTEM

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Congratulations on your purchase of Prowess *FS²*. Prowess products are designed to be accurate, easy to use, and accompanied with detailed documentation. SSGI is dedicated to giving you continued support for your product with quick response to your questions, concerns, and comments.

The front cover of this manual reflects the software version you purchased. As new versions of the software are released, you may receive supplemental inserts. All information in this manual is current at the time of your purchase.

Table of Contents

INTRODUCTION

Prowess *FS²* is a two-dimensional film scanning densitometer. It is used to scan the image from an exposed radiographic film, convert to optical density or dose, and analyze the result. Except for the densitometric image scanner, all components of Prowess *FS²* are standard items of computer equipment.

The program's user interface is demonstrated in Figure 1. It is comprised of four sections: the status bar, button bar, image port, and data port.

The status bar is located at the top of the screen and provides information about the program status and available options.

The button bar is located just below the status bar. Up to twenty buttons may be available on the button bar. Each button is used to initiate an operation. To operate a button, either click on it using the left mouse button or use the ALT key together with the button's command key. The command keys are underlined and highlighted on the screen.

The image port is located in the lower left part of the screen. Image data is presented here.

The data port is located on lower right part of the screen. The data port shows the file name and path of the current image, the image zoom, calibration data, as well as other image information. The window and level slider bars are located in the data port and other on-screen controls are presented here.

Figure 1

CALIBRATION AND ADJUSTMENT

I. IRIS ADJUSTMENT

Select CalIris to display the flattened and unflattened response of the CCD
detector. The calibrated line should be flat across most of its width and the
uncalibrated line should be 70-99% at its peak.
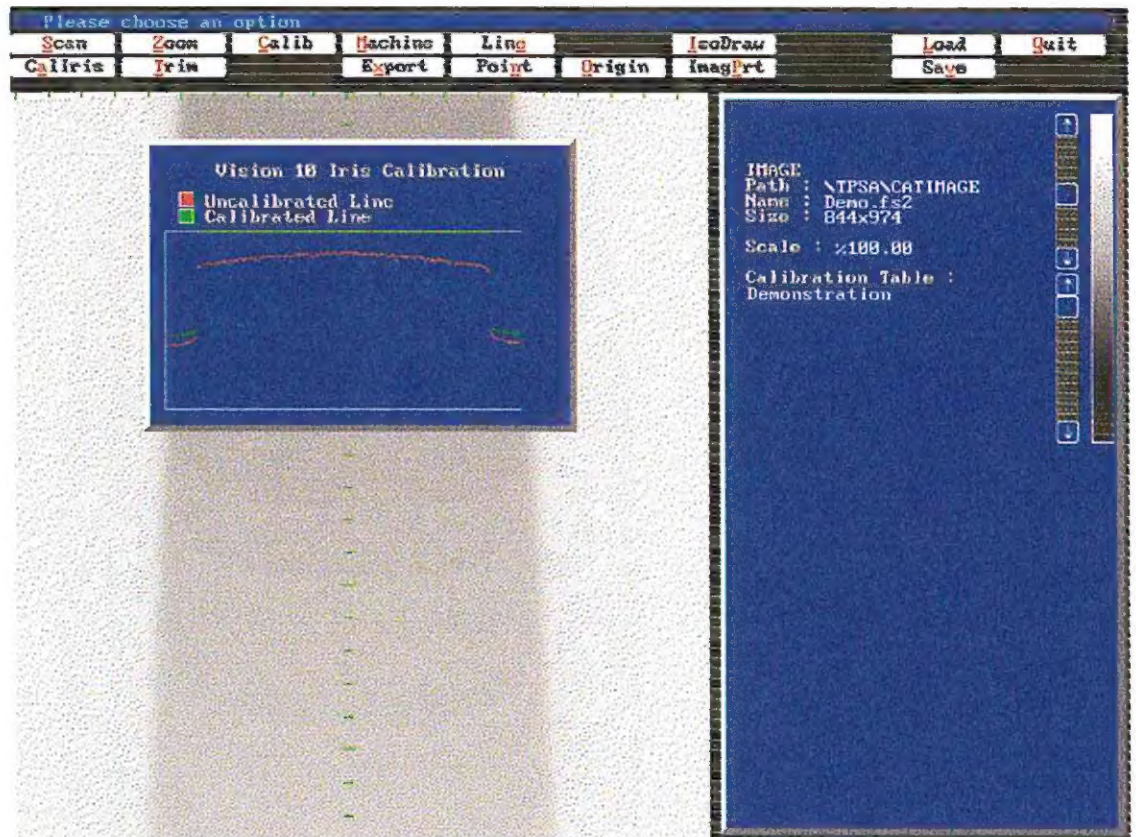
Figure 1

Open the scanner's lid by pressing a small Allen wrench into the circular holes
in the front on either side of the scanner. Adjust the f stop so that the
uncalibrated (red) profile is just below the flat calibrated (green) profile. It may
be necessary to keep the scanner at a partial f stop to achieve optimum
response. Do not open the f stop up too much as it will saturate the scanner.
Adjust the f stop so you get the flattest calibrated response possible without
saturating the detector. Close the lid and enter calibration tables.

II. DOSE CALIBRATION

To calibrate FS^2 to density or dose, select the Calib option from the button bar.

Figure 2

Enter a calibration table for each type of film or beam energy. Up to 20 values may be entered into each calibration table. The default configuration is optical density. It is suggested that this option remain the default configuration. To calibrate it, scan the 24 depth step-wedge. Select Calibr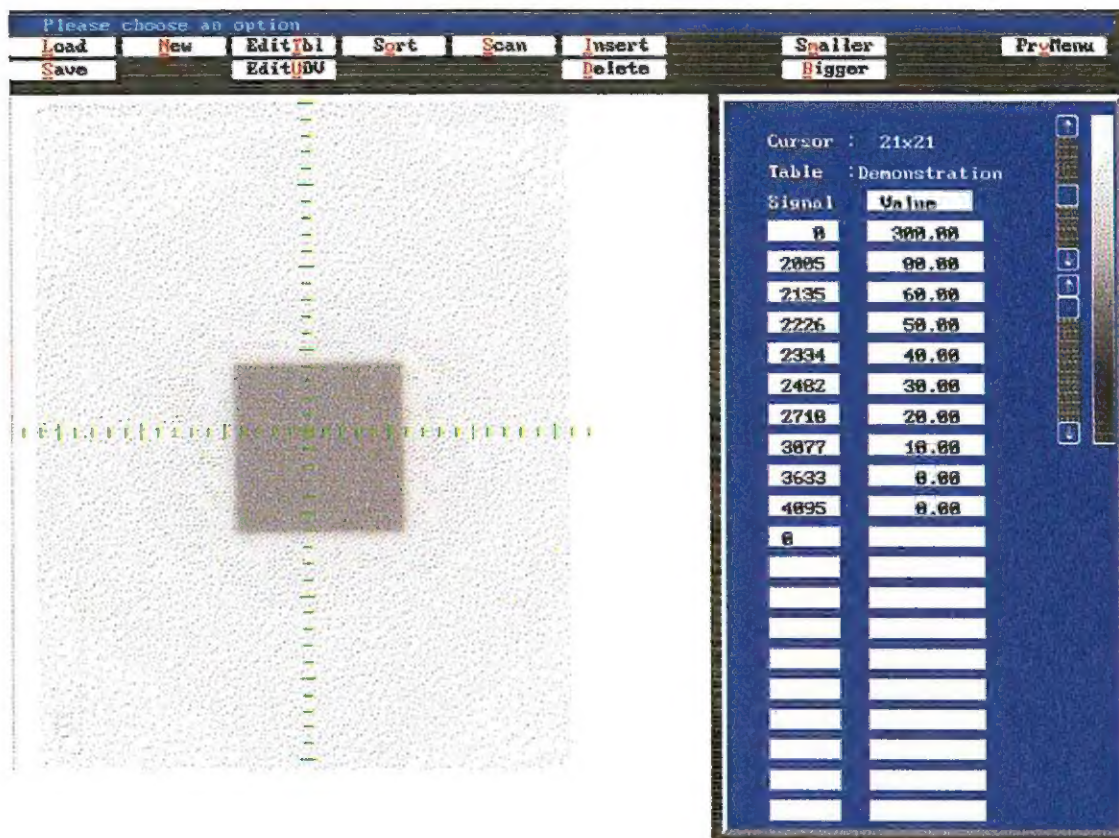ate and type in up to 20 depths from the step-wedge. Do not exceed a density of 3.0 as the scanner and software will not function beyond this density. Move the cursor and click on the first step in the image. Use the left button to record this value. Repeat for each step. You should now have recorded the ADC reading from the scanner in the left column against the OD in the right column. Notice that as the density increases, the scanner reading decreases. Select Sort and then Save. Select the first item on the list to save this optical density. Exit calibration. To test these values, select Point and measure each one of the steps to be sure that the measured density agrees with the calibrated value. You have now calibrated the film densitometer software with the scanner.

Repeat this procedure for each of the film types and beam energies that will be measured. Calibrate the scanner by exposing separate films to varying doses. It is recommended that for RPV film, exposures of 0, 5, 10, 15, 20, 30, 40, 50,

60, 70, 80, and 100 cGy be made. Place the film perpendicular to the central axis of the beam at d_{max} or 5 cm deep. Scan each film and measure the density on the central axis for each of the steps in your calibration table. Complete your calibration for each of the energies that you will be using from this.

Scan the film first when using the scanner to measure dose distributions, then choose the appropriate calibration table. The calibration table may be changed at any time during analysis. Merely choose Calib and Load. After saving a calibration table, it can be reloaded at any time.

When in calibration mode, a calibration data entry window appears in the data port. Use this table to enter signal and associated density or dose values. A new entry field appears each time Insert is pressed. Initially, the fields are blank except for a signal value of 0 and 4095. To measure a signal value, move the cursor to a spot on the image and click with the left mouse button. This will enter the signal value of the specified region into the current calibration field.

Use the mouse and arrow keys to select a field in the calibration entry window. Delete will delete one row of calibration data.

A typical approach to calibration would be to scan in a sensitometer strip and then select Calib. Insert as many signal/value pairs as there are calibration regions on the strip. Then select the first signal field and click on the first calibration region on the image. The signal from that region appears in the signal field. Select the value field to the right of the signal just entered and key in the associated value. Continue until done, then select Save to complete.

Calibration values must monotonically increase with decreasing signal. When the data is saved, it is automatically sorted. Select Save to save the calibration curve. Select one of the existing table names or enter a new one.

III. Calibration File

The scanner calibration file is found in the C:\PROWESS directory. This file is called FS2CALIB.DAT. It is a binary file and contains the calibration tables for the scanner.

IMAGE ACQUISITION AND BASIC PROCESSING

I. Scan

To scan a film, simply place the film (face up and top first) into the entry slot of the image scanner (the film scanner must be turned on at least two hours prior to use). Select Scan from the button bar. After processing, the image is captured from the film and appears in the image port.

II. Zoom

Select Zoom from the button bar at the top of the screen to zoom in on a specific part of the image.

Once in the zoom submenu, a box appears in the image port. This box is used to select a zoom area. By selecting ZoomIn or ZoomOut, the area on the screen to be displayed will increase or decrease in size by a factor of 4. Selecting the option again changes the area by a factor of 16. To move the box, click with the left mouse button inside the box, holding the button down while moving the mouse. Release the left mouse button to drop this box. Select Accept.
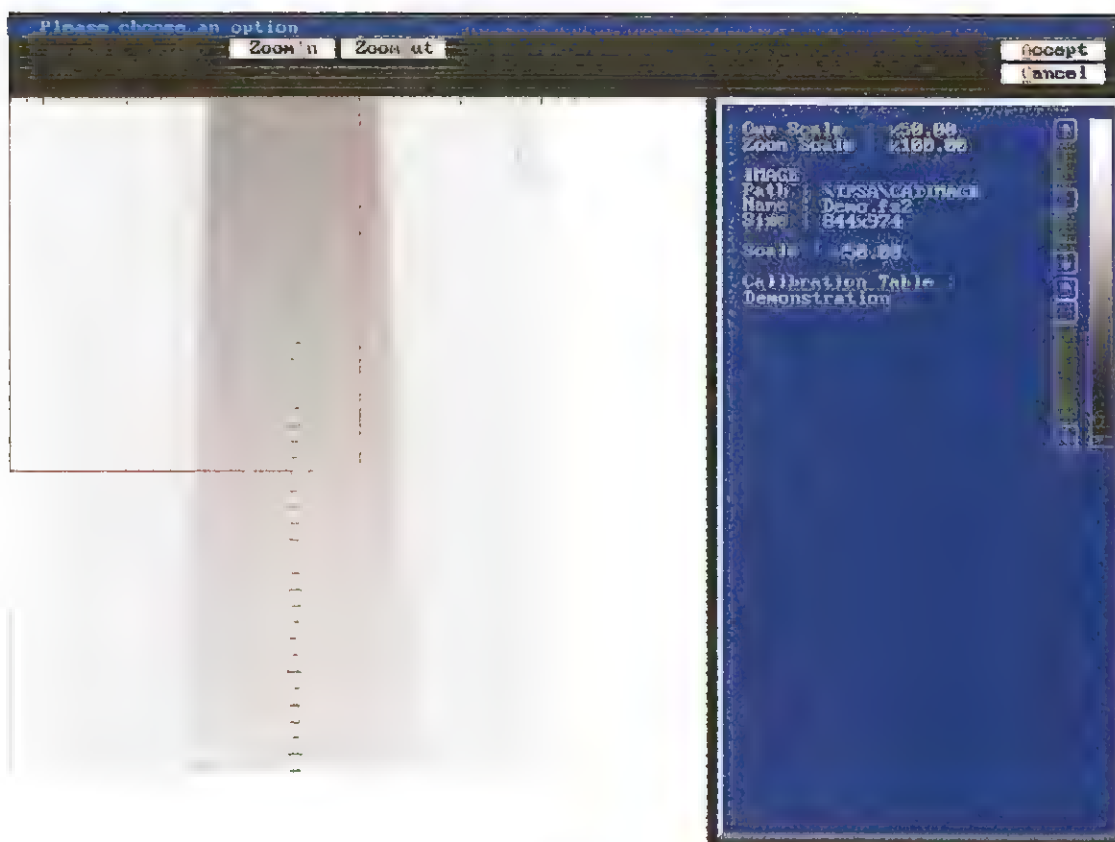
Figure 1

SECTION THREE
Image Acquisition and Basic Processing

III. Window

After an image has been scanned, use the arrow keys to adjust the window and level settings. Alternately, you may use the mouse to select the arrow markers or sliders on the window and level bars.

Windowing does not affect the image, it merely affects the way in which the image is displayed and printed.

IV. Set Origin

Use Origin to set the image origin. All coordinates are reported in reference to the origin. The default origin is the center of the image. When this item is selected, the mouse becomes the scale icon. Drag it to the desired location and drop it by releasing the left mouse button.

V. Trim

The trim option is used to delete unnecessary parts of a scanned image. To trim an image, select Trim from the button bar and then indicate the upper left and lower right corners of the useful part of the image. All image data outside the trim box is deleted. Trimmed images occupy less disk space than un-trimmed images.
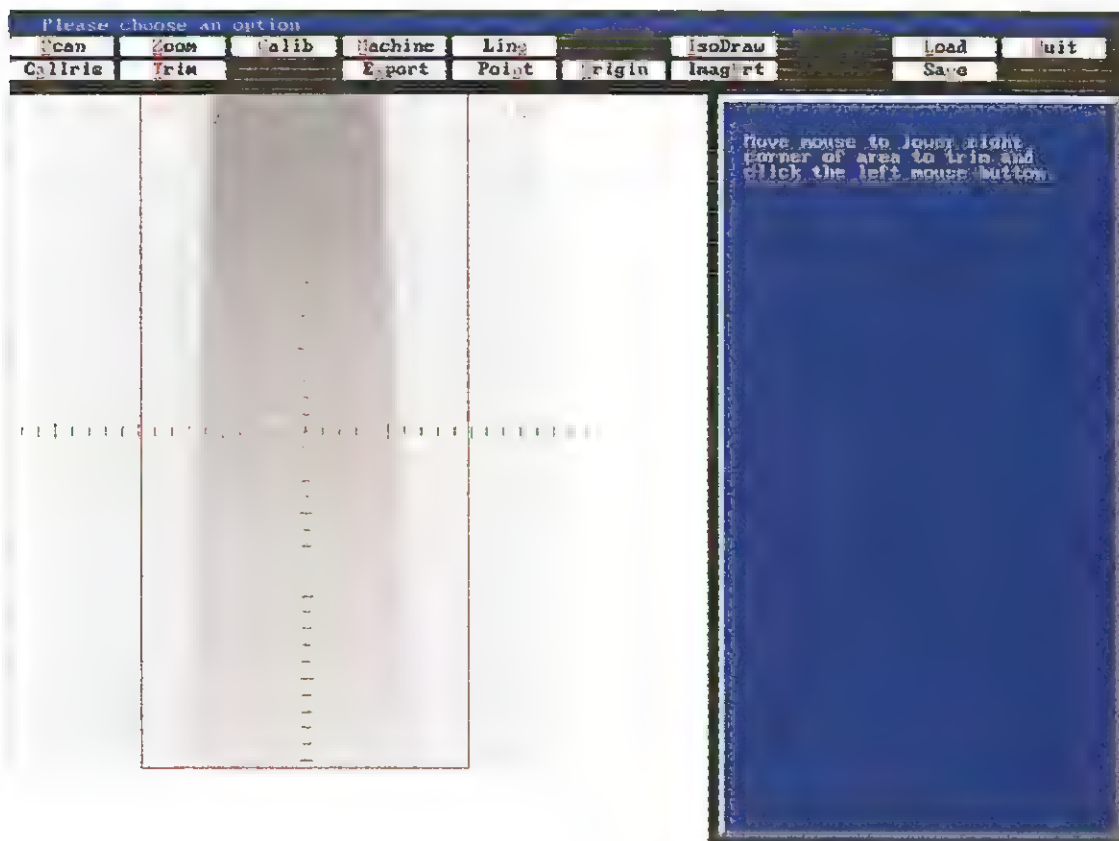

Figure 2

ADVANCED PROCESSING AND ANALYSIS

I. Measure Points

Choose the <u>P</u>oint option to measure dose or density at a point. A square box of variable size will appear. The size of the sampling region is reported in the data port. Select <u>Sm</u>aller or <u>B</u>igger to resize the area. The average value within the box is updated as the icon is moved.

To save a point, press the left mouse button. The location and value of the region will be added to the list in the data port. A blue number and cross will appear on the image to show the measured region.

Figure 1

To normalize to a point, select <u>N</u>orm and a point in the list. Move the mouse vertically to highlight the point and then click the left mouse button to select it. If you prefer, use the arrow keys to select the point and the Enter key to normalize to it.

Normalization is done from within the Point submenu. First, save the normalization point by clicking on it. Select Norm once the point is saved. The maximum point is automatically placed at the top of this list. To normalize, select the desired point desired and press Return or the left mouse button. The active point is highlighted in red. To unnormalize at any time, select Unnorm.

II. Scan Lines

This feature is used to view a graph of dose along a line. Choose Line and a graph will be displayed in the data port. Click on either end of the line.
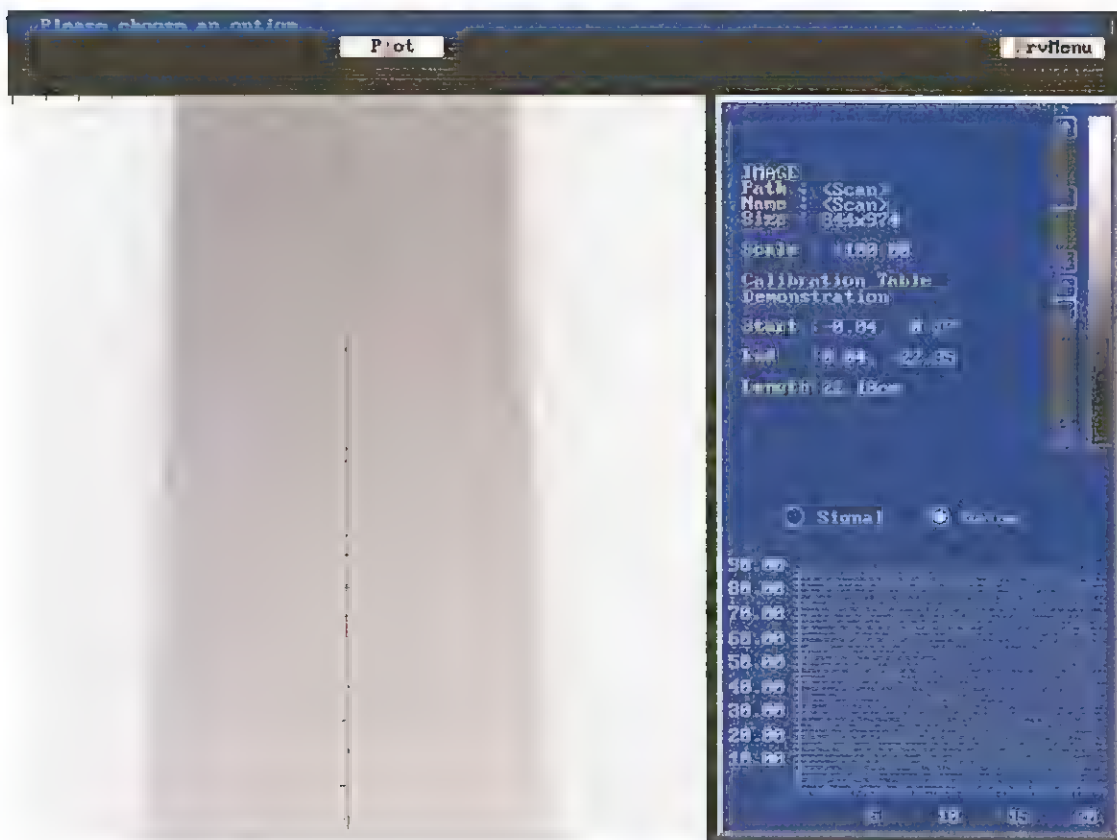

Figure 2

III. Map Isolines

This feature is used to display isolines. The isoline is drawn when a valid entry is made in a cell. The color of the box corresponds to the isoline. You may Plot or ImagPrt from within IsoDraw.
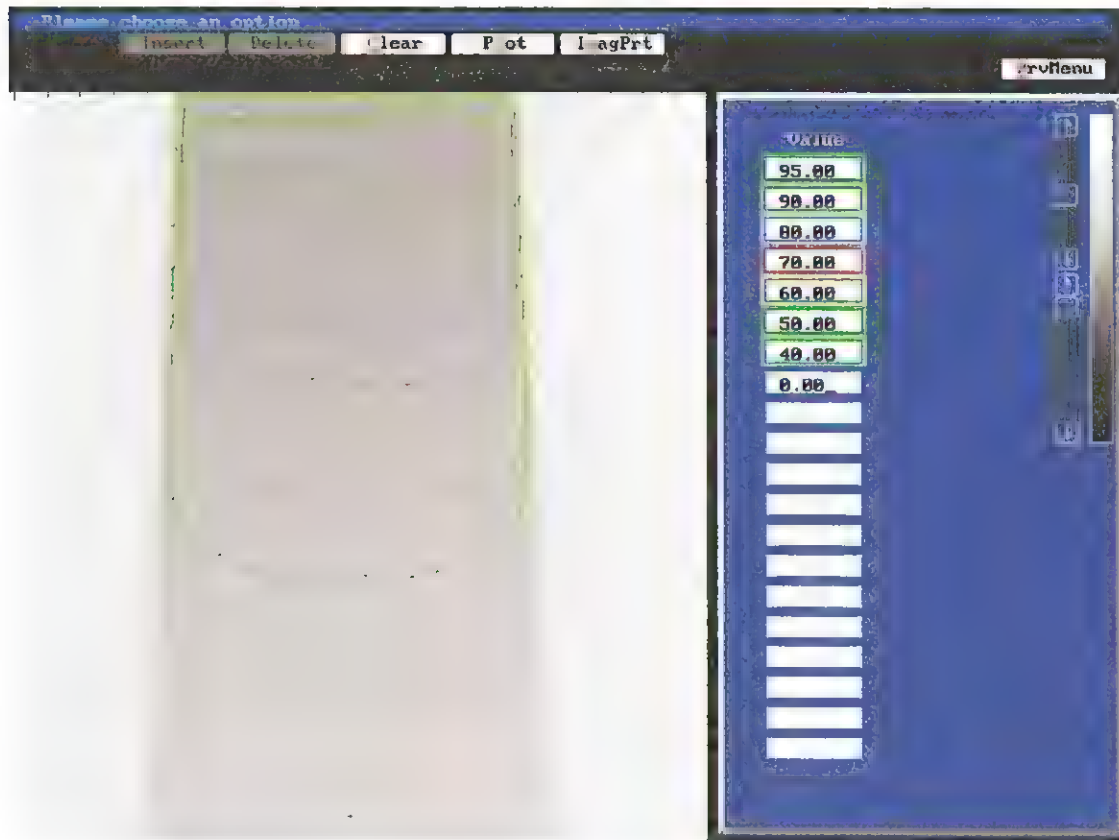
Figure 3

IV. Extract Machine Data

Use the Machine option to extract machine data (percent depth dose and profiles) from a teletherapy beam image. To make this image, expose a film in phantom with the film oriented parallel to the beam's central axis. Machine data is written in the Accuscan format.

When the Machine option is selected, a beam icon appears in the image port. This icon is constructed of a set of line segments representing the central axis, beam edges, and profile scans. To move the beam within the image port, click on the beam's isocenter point with the left mouse button. To rotate the beam around it's isocenter, click on the deepest point along the central axis.

Along with the beam icon, a number of entry fields are presented in the data port. The numbers in these fields control the shape of the beam icon and, ultimately, the type of beam data exported. Use the buttons (SSD, Width,

BeamX, BeamY, MxDepth, Mx2X/W, Gantry, Profile) to edit these values or, if you prefer, just click on the field with the mouse. The coordinates BeamX and BeamY, control the location of the isocenter in the beam image. The Gantry angle specifies the rotation of the beam around the isocenter. The SSD controls the divergence of the beam edges and the Width controls the distance between them.

The value of MxDepth specifies how far along the central axis %DD data will be collected. The Profile depths are the depths at which lateral profiles are to be measured and Mx2X/W specifies how wide those profiles are to be.

When all of the beam parameters have been adjusted to appropriate values, select Accuscn. The screen changes as shown in Figure 4.
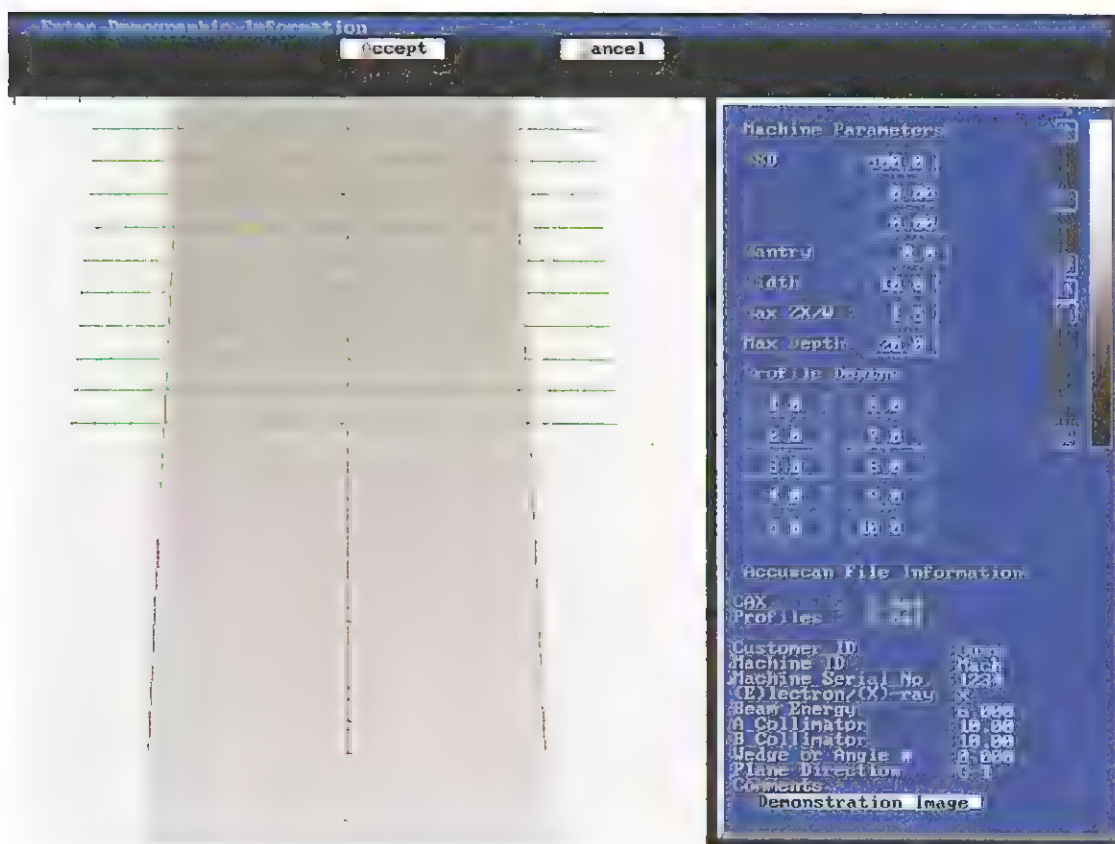
Figure 4

The machine file names are shown in the data port. In this case, the central axis %DD will be saved as 1.dat and the OCR profiles will be saved as 2.dat. These numbers are incremented each time files are saved. In addition, a set of text fields are shown which correspond to fields in the scanner file header. Fill in these fields with information about the current measurement. Select Accept to write the text files. In addition to the .dat files which contain the scan data, .hdr files are also written. The .hdr files are needed to import data into Accuscan. Files are written to the machine directory.

V. Export Image Files

To export an image file, select the Export option from the button bar.

Figure 5

Select the BMP option to write a bit-mapped Windows image file. Select Sprdsht to write a comma delimited text file.

FILE HANDLING

I. Load and Save

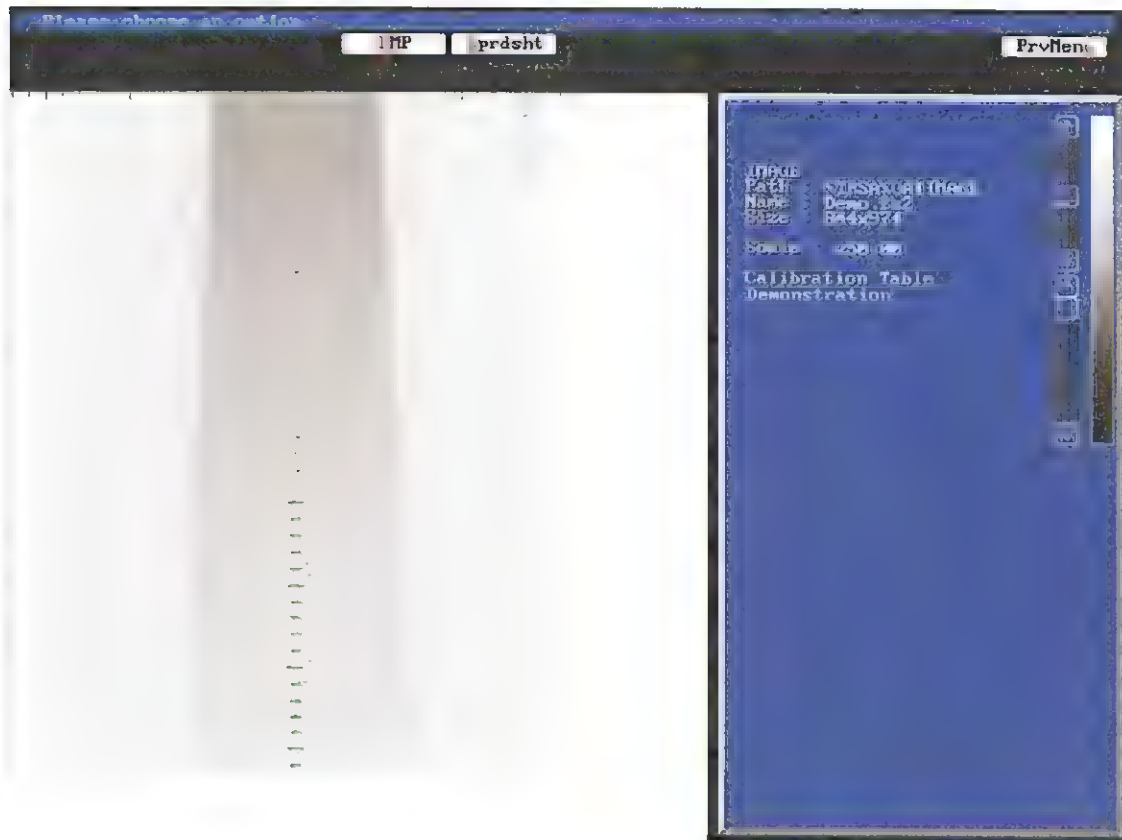After an image is acquired with FS^2, it is possible to save the image. The entire unzoomed image is saved, thus, FS^2 images can sometimes be over 1 megabyte. Images are stored in the CATIMAGE directory and have the extension .FS2. You will be prompted for a file name when loading and saving. Use different names for different images to avoid overwriting files. The program displays the file name on the right side of the screen after it is saved or loaded. An image which has not been saved has no name. FS^2 images cannot be read during Prowess treatment planning.

II. Archive

Select **Patient File Management** from the Configuration Menu.
Select **File Management** from the Main Menu.
Pop-Up DOS[1] can be started from the C:\> prompt by typing "POPDOS".

DOS has a tree-like directory structure. To go into a directory, select the directory name (i.e., PROWESS) with the mouse or cursor keys and press the **Enter** key.

To move to the parent directory, select the [..] directory.

Prowess files are located in two places:
\PROWESS\MACHINE
\PROWESS\CATIMAGE

To change the way files are displayed: Select Options/Directory Display to sort files by date, file name, or type (extension) of file.

Select files by using the mouse or the keyboard. Tapping the space bar will highlight the file name. Clicking on the file under the mouse will also highlight the file.

Once a file or group of files are selected you can copy, delete, or remove them. Choose File to perform the desired function to these files.

To copy a file, insert a diskette into the drive. Select Disk/Format from the Pop-Up DOS menu. A screen will come up asking for volume name (usually leave blank), diskette format (either 1.2 MB 5.25" or 1.44 MB 3.5"), and diskette drive (**A:** or **B:**). Choose the correct sizes and select OK.

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1. Pop-Up DOS is distributed by SSGI under license from Logitech Software.

Once selected, files can be copied to another directory or a floppy disk. Select File/Copy. If copying the file to a floppy drive, type **A:** or **B:**. If copying the file to another directory, type the path of the directory (i.e., C:\PROWESS\OLDPAT\).

Delete selected files by choosing File/Delete (Note: Select delete with the mouse. Pop-Up DOS does not allow the keyboard command to work).

Pop-Up DOS has the ability to find and correct disk defects. Select Disk/Check Disk to activate.

HARDWARE CONFIGURATION

I. IBM-Compatible 80486 Based Personal Computer

An MS-DOS™ compatible computer system is needed for Prowess *FS²*. The computer must use an Intel 80486 or Pentium processor with a minimum of 8MB of RAM.

The disk operating system used by the computer is MS-DOS™ 6.2 or higher.

The display must be a Super Video Graphics Display Adaptor (SVGA) with at least 512K of memory.

Most SVGA graphics adapters are supported. Resolution of 640x480, 800x600, and 1024x768 in 256 colors are allowed. 800x600 is recommended. The resolution is selected in the configuration file discussed later in this section.

The computer must have at least one parallel port to interface to a plotter. Mouse support is provided through a serial port or a bus interface card. The scanner uses a bus interface card.

The mouse can be used for interaction with *FS²*. Use the mouse by sliding it on the table top. There are two active buttons on the mouse. The left button is equivalent to the **Enter** key on the keyboard. The right button is usually equivalent to the ESCape key.

The computer uses an internal hard disk drive labeled drive (**C:** or **D:**). Put the computer in a place where it will not be bumped or disturbed.

Floppy disk drives are used for installation of new programs and archival storage. There are several types of floppy disk drives. One type is a 5.25" soft, high density floppy drive that holds 1.2MB of data and requires a special high density diskettes. Another type is a standard 5.25" soft, double sided, double density drive storing 360KB of data. The third type is a 3.5" floppy drive of 1.4MB or 720KB format. Do not leave floppy disks in the drive when the power is turned off.

For optimum floppy disk life and performance, keep soft floppy diskettes in their envelopes at all times when not in use. Never touch exposed floppy disk surfaces. Never bend floppy disks. Keep floppy disks and all magnetic media away from magnetic fields and protected from temperature extremes.

Before data may be stored on a floppy diskette, the diskette must be formatted. Formatting a diskette destroys all previously stored data. Insert the proper diskette into Drive A:. Go to DOS (F10, F10 from the Main Program Menu). At the "C:>" prompt, type: **Format A:** (or **B:**) and press **ENTER**.

Once a diskette has been formatted, program files and image files may be transferred from the hard disk to the floppy for archival and backup purposes using MS-DOS copy commands. Refer to the MS-DOS manual for details.

II. Image Printer/Plotter

A hardcopy output device is needed to generate printed results. The Hewlett-Packard DeskJet 1200 C/PS™ or PaintJet XL300™ can produce grey scale printed images with or without color plots. The HP LaserJet 4M™ (with 6 MB of memory) is able to produce grey scale images with or without black and white plots. It is recommended that the LaserJet 4M be used only in conjunction with a color plotter. Either the DeskJet 1200 C/PS™ or PaintJet XL300™ are recommended for use with FS^2.

Read the operator's part of the user manual for the printer/plotter to become familiar with its features. This guide describes the setup procedures, use, and maintenance of the device.

III. 14FS Film Scanner

The Prowess 14FS film scanner operates by rolling a radiographic film between a light source and a CCD image sensor. The digitized image is then processed and made available for use. There is no setup involved in the use of the scanner. The film is placed against the input slit of the scanner and the command given to Scan. It may be necessary to force the film slightly between the rollers at the input slit.

Be sure to read the scanner user's manual before use. To insure stability, the scanner must warm up for at least two hours before use.

IV. Power protection

A surge protection device should always be used to protect the computer and scanner from power surges. If power failures are common, then an uninterruptible power supply is necessary.

V. Installation

A. Hardware

Refer to component manuals before attempting hardware installation. When shipped by SSGI, hardware components are marked to permit easy installation.

B. Component Configurations and Specifications

1. Prowess 14FS Film Scanner

Interface card
No user changeable settings. No drivers need to be installed.

2. Hewlett-Packard DeskJet 1200 C/PS™ Plotter

Parallel only. All switches set down.

3. Hewlett-Packard LaserJet 4M™ Printer

Set default font to PC-8 of 10 cpi (Internal 32). Page Protection to LTR.

4. Hewlett-Packard PaintJet XL300™ Plotter with Postscript

Parallel only (serial is too slow).

Switch settings: BAUD0-0, BAUD1-0, PAR0-0, PAR1-0, XON/XOFF-0, MET-1, ROM8-1

5. Hewlett-Packard 7550A™ Plotter

Serial 9600, 8 bit, no parity bit, 1 stop bit, hardware handshake HP-IB-Standard, bypass off, mode direct, remote, stand along, half duplex, monitor mode off.

6. Hewlett-Packard 7475A™ Plotter

```
9600 baud, 8 bit, no parity bit, 1 stop bit
Baud            B1          0
                B2          1
                B3          0
                B4          1
Size            A3          1
Met             US          1
                Y           0
Parity          S1          0
                S1          0
```

7. HP Pen colors

HP7475A	HP7550A
1 black (wide)	1 black (side
2 red	2 red
3 green	3 green
4 orange	4 orange
5 blue	5 blue
6 purple	6 brown
	7 purple
	8 yellow

8. HP Pen Specifications

Pen Size	.3 mm for color pens,
	.7 mm for black pens
Pen Type	Fiber tip paper pens for use on paper

9. CABLE - Plotter to CPU (LPT1)

7475A HP Plotter (DB25 Male) 7550A HP Plotter (DB25 Female)	CPU (DB9 Female) CPU (DB9 Female)	CPU .(DB25 Female) CPU (DB9 Female)
2	2	3
3	3	2
5 & 6	4	20
7 ground	5	7
20	6 & 8	6 & 5

10. CABLE - Printer to CPU (LPT2)

Printer Standard Centronics Parallel Connector	CPU Standard DB25 Male Connector

11. CABLE - Monitor to CPU (SVGA)

Special 15 pin monitor cable to CPU

12. Serial COM Port Addresses

COM PORT	Address	Interrupt Level
COM 3	3E8	IRQ2 (Vector Address 34)
Bus Mouse		
COM2		IRQ5
COM 1		IRQ3
		IRQ4

Everex Magic I/O Serial Board, Model 170B		
COM 3	SW1	Interrupt 2 Jumpers
1	Off	oooooo
2	Off	ooooọo
3	On	oooõóo
4	Off	SERCHINT
LPT	Off	LPTSEL

XIII. Control File

There is a master control text file that configures the entire Prowess *FS²* system. Care must be taken before making any changes as it will have significant effects on the operation of the program.

The name of the control file is: **TPS3.CTL** and is located in the C:\PROWESS directory of your hard disk drive. Each time this file is updated, Prowess programs recompile the file into a usable format. Be sure the security plug is in place before changing the control file. The system will not work properly if the control file is compiled without the security plug in place.

To edit the control file, choose Edit Configuration from the Main Prowess FS^2 Menu. The system uses EDIT, the DOS text editor to edit this file. Use the arrow keys and page up and down to move throughout the file. The insert, backspace, and delete keys work normally. To end the session: Alt-F, then X. Press Y to save the file. The next time you run FS^2, the control file will be compiled.

The control file is a text file written using English terms. An active line or command starts with a ">" symbol in column one followed by a command. The command is usually one or more words in all capital letters. For example,
>PLOTTER is HPPaintJet3 at LPT1
All other lines are treated as comments and must start with a blank space or a semicolon (;).

The file has been organized by category. The general categories include: file location paths, display colors, menu and submenu items, peripheral device list, serial port parameters, plotter settings, and paper size.

XIV. .INI File

A second text file is also used to configure the system. This file is called **TPS.INI**. It is also found in the C:\PROWESS directory. This file controls the screen resolution and the scanner feed parameters.

The exact format of each command line is important. Before changing any line, ensure you understand its format and usage. Should you have any questions concerning this file, please call SSGI Technical Support.

PRODUCT SUPPORT

I. Product Support

SSGI can be contacted by telephone at (916) 898-0660 between the hours of 8:00 a.m. and 5:30 p.m. Pacific Time or by fax at (916) 342-8966 at any time.

II. Bulletin Board

In order to use SSGI's bulletin board service, please follow the instructions as outlined below:

1. **Turn your Modem on. Select Procomm or Procomm Plus from the Main Menu.**

2. **Setting up Communication Parameters:**
   From the Procomm "Ready" screen, type Alt-P. This brings up the port selection menu. Make settings:

Baud Rate:	2400 (or 9600)
Parity:	None
Data Bits:	8
Stop Bits:	1
Port:	COM1, COM2, or COM3 depending on which port the modem is plugged into on your computer

   Save changes

3. **Setting up Dialing Directory:**
   Type Alt-D from the Procomm "Ready" screen. This brings up the dialing directory menu. If the phone number you want to call is shown, go to Step 4.
   To revise an entry, Type "R".

Name:	SSGI Bulletin Board
Number:	1-916-898-0675
	(add a 9 if your facility requires it)
Baud:	2400 (or 9600)
Parity:	None
Data Bits:	8
Stop Bits:	1
Other Parameters:	Accept Default Values

4. **Dialing the Number:**
   Select the number in the Dialing Directory you wish to call. The modem will dial the number and connect you wtih the remote computer.

5. SSGI Bulletin Board:

Accounts have been set up for each Prowess facility under the name of our principal contact. If you desire other accounts, call us.

If you cannot access your account:

Enter full name:	TPS User
Password:	Prowess

6. Sending a file:

Type:	"F" to select File Menu
	"U" to Upload a file
	"X" for XModem protocol
File to Upload:	Type in file name
	Press Page Up key
	(Tells Procomm to upload file)
Type File Name:	(need exact location of file: e.g., "TPS'BIN'CLINAC6.MCH)

7. Downloading a file from BBS:

Type:	"F" to select File Menu
	"A" to select a new file area
	"L" to list files in the area
	"D" to download a file
Files to Download:	FILE.EXT (type file name)
	"X" for XModem protocol
	Press Page Down key
	(Tells Procomm to download file)

8. Leaving a Message:

You can leave a message for Glen Orcutt (Product Support) to let him know you have left a file:

Type:	"M" from main menu to get message menu
	"P" to post a message
To:	"Glen Orcutt" (follow directions)
Type:	"S" to save and send message

9. Exiting BBS:

Type:	"G" for Goodbye
	"G" for Goodbye, Really!

PROWESS TECHNICAL SUPPORT FAX TRANSMITTAL SHEET

To: SSGI Customer Support

Fax No.:   (916) 342-8966

Date: _____

From: _____

Center: _____

Tel No.: _____

Fax No.: _____

No. of Page(s): _____ (including face sheet)

SSGI

1370 Ridgewood Dr., Ste. 20
Chico, California 95926 USA
Tel: 916-898-0660
Fax: 916-342-8966

Prowess Customer Support:

I have...
- ☐ a problem with...
- ☐ a suggestion for...

- ☐ Prowess *2000* Ver_____
- ☐ Prowess *3000* Ver_____

- ☐ Release Date: ___/___/___
- ☐ Release Date: ___/___/___

- ☐ External Beam Program
- ☐ MRI/CT Film Scanning Program
- ☐ Brachytherapy Program
- ☐ Irregular Field Program
- ☐ Daily Calculation Program
- ☐ Machine Data Entry Program
- ☐ Source/Template Entry Program
- ☐ Film Densitometry Program

regarding...

- ☐ Calculation
- ☐ Hardcopy
- ☐ Contour Entry
- ☐ Beam Entry
- ☐ Image Entry
- ☐ File Save/Retrieve

☐ Other: _____

Description:

_____

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III. Internet Technical Support

SSGI is now on the Internet. To send our technical support staff an e-mail message, address the message to the following address:

support@ssgi.prowess.com

Internet e-mail sent to this address gets routed directly to the desktops of the technical support staff. Using this mechanism for support allows the technical support staff to direct your queries to the appropriate personnel, if necessary, without the possibility of interpretation error. Essentially, this gives our Internet-connected customers direct communication with the SSGI staff without the cost of placing a long distance phone call.

SSGI

a California Corporation
1370 Ridgewood Drive, Ste. 20
Chico, California 95926

Support Offices:
Tel: 916-898-0660
Fax: 916-342-8966
Sales Office:
Tel: 714-374-0833
Fax: 714-374-0835